



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of: Hongy Lin et al.

For: POWER ADAPTER FOR NOZZLE HEATER AND
TERMINATION METHOD FOR THICK FILM
RESISTANCE HEATER

Serial No.: 09/595,951

Filed: June 16, 2000

Examiner: D. Nguyen

Group Art Unit: 3729

Commissioner for Patents
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Alexandria, VA 22313

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Dear Sir:

AMENDED APPEAL BRIEF UNDER 37 C.F.R. § 1.192

This Appeal Brief is relevant to the Notice of Appeal filed September 18, 2003, and responsive to the Office Action dated March 18, 2003, and Amended pursuant to the Notification of Non-Compliance dated February 6, 2004 and having a shortened statutory period of response set to expire March 8, 2004.

1. REAL PARTY IN INTEREST

Applicant states that the real party interest is Watlow Electric Manufacturing Company ("Watlow"), by virtue of an assignment of Applicants' entire interest in the application to Watlow.

2. RELATED APPEALS AND INTERFERENCES

Applicants are not aware of any related appeals or interferences.

3. STATUS OF CLAIMS

Claims 1-12 were canceled without prejudice subsequent to a restriction requirement by the Examiner. Claims 13-42 are pending, all of which have been finally rejected by the Examiner. Applicants appeal the rejection of claims 13-42. It should be noted that the Examiner has stated in the Office Action Summary that claims 30, 31, and 40 are included in the final rejection, but no grounds for rejection were given for these claims.

4. STATUS OF AMENDMENTS

An Amendment filed September 18, 2003 with technical corrections to the Applicant (deletion of some inventors) and Title made necessary by the restriction requirement, were not entered by the Examiner and remain pending.

5. SUMMARY OF THE INVENTION

The present invention relates to a method of terminating thick film heating elements in general, and particularly on nozzle heaters used in the plastics industry. The nozzle heaters (16) provide a good example of a heater with a thick film heating element (18) which benefits greatly from the present invention. Terminal plates (22) are affixed to the ends of the heating element (18) to provide for a connection to a power source. The present invention provides a novel and unconventional method of affixing these terminal plates (22).

The most common method of affixing terminal plates (22) to the heating element (18) is soldering. In contrast, the present invention uses an electrically conductive,

noble-metal based adhesive (72) as a bonding agent between the terminal plates (22) and the heating element (18). See page 11, generally.

This bonding agent should have a high melting temperature (900°C or greater). The preferred embodiment uses a silver-based bonding agent, but any noble-metal should work. This bonding agent is applied directly to the heating element (18) at an end portion (74) (known as the "terminal pad"). The terminal plate (22) is then placed over the terminal pad (74). After the terminal plate (22) is in the proper place, the adhesive is dried and sintered, resulting in an electrical connection between the terminal plate (22) and the heating element (18) that is superior in its physical and electrical properties to the known prior art. The application also shows an example of the same method being used with thick film heaters in configurations other than nozzle heaters (See Fig. 21).

6. ISSUES ON APPEAL

Applicants present the following issues to the Board:

(1) Whether claims 13-17, 22, 25-29, 32-36, 38, 39, 41, and 42 are unpatentable under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 4,183,136 to Colla ("Colla");

(2) Whether claims 18, 19, and 37 are unpatentable under 35 U.S.C. § 103(a) as being obvious over Colla in view of U.S. Patent No. 4,803,345 to Hoshizaki et al.;

(3) Whether claim 20 is unpatentable under 35 U.S.C. § 103(a) as being obvious over Colla in view of U.S. Patent No. 5,492,653 to Hochheimer et al.;

(4) Whether claim 21 is unpatentable under 35 U.S.C. § 103(a) as being obvious over Colla in view of U.S. Patent No. 5,492,653 to Hochheimer et al., and further in view of U.S. Patent 5,781,402 to Fujijama et al.;

(5) Whether claim 23 is unpatentable under 35 U.S.C. § 103(a) as being obvious over Colla in view of U.S. Patent No. 4,306,217 to Solow;

(6) Whether claims 24 and 41 are unpatentable under 35 U.S.C. § 103(a) as being obvious over Colla in view of U.S. Patent No. 5,429,657 to Glicksman et al.; and

(7) Whether claims 30, 31, and 40 are unpatentable in light of the fact that no grounds for their rejection was given.

7. GROUPING OF CLAIMS

Applicants state that pending claims 13-29, 32-39, 41, and 42 stand or fall together ("Group 1"). Claims 30, 31, and 40 stand or fall together ("Group 2").

8. ARGUMENT

A. Argument Related to Group 1.

(1) Claims 13-17, 22, 25-29, 32-36, 38, 39, 41, and 42 are patentable over Colla

For a claim to be obvious there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference(s) or to combine reference teachings. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). There must be also be a reasonable expectation of success, and the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *Id.*, MPEP § 706.02(j).

The initial burden is on the Examiner to provide the suggestion of the desirability of the claimed invention. *Ex parte Clapp*, 227 USPQ 972 (Bd. Pat. App. & Inter. 1985).

For most of the claims in the present case, the Examiner relies solely on Colla. In the remaining claims, the Examiner still relies heavily on Colla to teach or suggest the basic elements of the claims and other prior art to suggest the combination of the limitations added in the dependent claims.

The flaw of the Examiner's argument is entirely based on a misreading of Colla. The Examiner points to the "ink material" of Colla as being the noble-metal-based bonding agent. To the contrary, Colla actually discloses that the conducting connecting tabs (7) are made of a precious metal (col. 4, ll. 5-7). These connecting tabs (7) in Colla are the equivalent of the Applicants' terminal plates. In fact, Colla later calls this same item "soldering tabs" (col. 6, ll. 5-7), and describes the power leads (8) as being "conventionally and directly soldered to the tab 7," (col. 6, ll. 16-17). Very plainly, these connecting tabs/soldering tabs are the same as terminal plates in Applicants' claims.

The tabs (7) in Colla are described as being made of precious metals (silver-palladium alloys and gold-palladium alloys). These tabs are connected directly to the thick film element (6)¹. Thus, there is no mention of a separate bonding agent. If one were to interpret, *arguendo*, that the tabs (7) constitute a noble-metal-based bonding agent as used in Applicants' claims, then Colla is left without the terminal plates claimed by Applicants.

¹ It should be noted that the thick film conductive element (6) in Colla is never described as a "heating element," because the device in Colla is not meant to be a heater, but rather a temperature sensor.

Furthermore, the tabs in Colla cannot be considered “bonding agents” because they do not act to bond anything. The verb “bond” is defined by Webster’s New Collegiate Dictionary (G. & C. Merriam Co., 1977) as “to cause to adhere firmly.” (definition 3a). This is the only definition that makes sense in the context of Applicants’ claims and specification. Colla’s tabs start in an ink or paste form, and are then applied directly to the thick film element. What may be confusing to the Examiner is that this thick film element is occasionally described in the specification as being made from a “bonding paste,” but that bonding paste is disclosed as being made from nickel and not a noble-metal.

Even if Colla is held to inherently provide a suggestion to affix a separate terminal plate over a noble-metal-based bonding agent, the requirement that there be an expectation of success is still lacking. One of the objects of Applicants invention was to provide a thick film heater termination method that can withstand high temperatures, beyond the 125°C to which solder is limited. (p. 3, ll. 13-14). Applicants disclose that the claimed invention can withstand operating temperatures up to 500°C (p. 12, l. 16). The Colla device is not a heater. It is a temperature sensor that relies on the resistance of the thick film element to vary linearly with temperature over a specified range. Figures 7 and 8 of Colla show the temperature range under which the device is designed to operate – namely 20-40°C. Plainly, the Colla is designed for temperatures an order of magnitude cooler than Applicants’ invention.

Accordingly, Applicants respectfully submit that Colla does not provide any teaching or suggestion of applying a terminal plate to a thick film heating element using a noble-metal-based bonding agent therebetween. Furthermore, none of the

references cited in this case provide any such teaching or suggestion when combined with Colla, nor do Colla or the other references provide any reasonable expectation of success in creating a thick film heating device according to the claimed invention. For these reasons, Applicants submit that the claims of Group 1 are patentable over the prior art and respectfully request the Board reverse the Examiner's rejections.

(2) Claims 18, 19, and 37 are patentable over Colla and Hoshizaki et al.

For the reasons set forth in subsection (1), above, Colla fails to disclose a noble-metal-based bonding agent. Those arguments are incorporated herein by reference. For these reasons, there is no teaching or suggestion to combine Colla and Hoshizaki to use a noble-metal-based bonding agent between the thick film element and the terminal plate.

(3) Claim 20 is patentable over Colla and Hochheimer et al.

For the reasons set forth in subsection (1), above, Colla fails to disclose a noble-metal-based bonding agent. Those arguments are incorporated herein by reference. For these reasons, there is no teaching or suggestion to combine Colla and Hochheimer to use a noble-metal-based bonding agent between the thick film element and the terminal plate.

(4) Claim 21 is patentable over Colla, Hochheimer et al., and Fujijama et al.

For the reasons set forth in subsection (1), above, Colla fails to disclose a noble-metal-based bonding agent. Those arguments are incorporated herein by reference. For these reasons, there is no teaching or suggestion to combine Colla, Hochheimer, and Fujijama to use a noble-metal-based bonding agent between the thick film element and the terminal plate.

(5) Claim 23 is patentable over Colla and Solow

For the reasons set forth in subsection (1), above, Colla fails to disclose a noble-metal-based bonding agent. Those arguments are incorporated herein by reference. For these reasons, there is no teaching or suggestion to combine Colla and Sollow to use a noble-metal-based bonding agent between the thick film element and the terminal plate.

(6) Claims 24 and 41 are patentable over Colla and Glicksman et al.

For the reasons set forth in subsection (1), above, Colla fails to disclose a noble-metal-based bonding agent. Those arguments are incorporated herein by reference. For these reasons, there is no teaching or suggestion to combine Colla and Glicksman to use a noble-metal-based bonding agent between the thick film element and the terminal plate.

B. Argument Related to Group 2.

(7) Claims 30, 31, and 40 are patentable in the absence of any grounds for rejection

Group 2 claims were not formally rejected by the Examiner in the last Office Action, but the Office Action Summary listed all claims as being rejected. Therefore, the status of these claims is uncertain. Applicants believe these claims should be allowable as no grounds for rejection exist, and none were given by the Examiner in either the Office Action of August 23, 2002 or the Office Action of March 18, 2003. Each of these claims provides an additional limitation over the rejected claims that is not shown in the cited prior art. Claims 30 and 31 require the additional step of firing the bonding agent until it has sintered. Claim 40 requires that the leads be attached by brazing.

Because no grounds of rejection were given for the Group 2 claims, and these claims are dependent claims containing additional limitations over the Group 1 claims, Applicants respectfully submit that the Group 2 claims do not rise or fall with Group 1 claims (however, being dependent upon Claim 1, these claims would necessarily be allowable if the Group 1 claims are allowed).

To the extent that Examiner contends that these claims are obvious and unpatentable over Colla (either alone or in conjunction with other prior art), Applicants still submit that the claims are allowable for the same reasons mentioned regarding Group 1 claims, above, which argument is incorporated herein by reference in its entirety.

For these reasons, Applicants submit that the claims of Group 2 are patentable over the prior art and respectfully request the Board reverse the Examiner's rejections.

9. APPENDIX

An Appendix containing a copy of the claims as they are currently pending is attached hereto. This Appeal Brief is being filed in triplicate pursuant to 37 C.F.R. § 1.192(a).

Respectfully submitted,



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APPENDIX

Claims 13-42 as presently pending:

13. A method of terminating a thick film heater comprising the steps of:
providing a heater and a plurality of termination plates, the heater having at least one thick film resistive heating element, each heating element having two end portions adapted to contact the termination plates;
applying a conductive noble-metal-based bonding agent to a contact surface between the termination plates and the end portions of the heating element; and
affixing a termination plate to each end portion of the heating element, the bonding agent being disposed therebetween, wherein the termination plate is adapted to receive power for the heating element from an external power source.
14. The method of claim 13, wherein the noble-metal-based bonding agent is silver-based.
15. The method of claim 13, further comprising the step of attaching a power conductor to each termination plate.
16. The method of claim 15, wherein the power conductors are attached by welding.
17. The method of claim 15, wherein the power conductors are attached by soldering.
18. The method of claim 13, wherein the termination plates are threaded studs.
19. The method of claim 13, wherein the termination plates are "L" shaped.
20. The method of claim 14, wherein the bonding agent consists of an ink comprised primarily of a silver alloy.
21. The method of claim 20, wherein the bonding agent further comprises a glass

frit.

22. The method of claim 13, wherein the bonding agent comprises a silver-palladium alloy.

23. The method of claim 13, wherein the heating element is protected by a dielectric except for a portion at each end, and wherein the termination plates are positioned to cover the unprotected portion of the heating element.

24. The method of claim 13, wherein said bonding agent has a melting point of at least 900°C.

25. The method of claim 13, wherein the bonding agent is applied by silk screen printing.

26. The method of claim 13, wherein the bonding agent is applied with a paint brush.

27. The method of claim 13, wherein the bonding agent is applied by spray coating.

28. The method of claim 13, wherein the bonding agent is applied by dipping the ends of the heating element in the bonding agent.

29. The method of claim 13, wherein the bonding agent is applied using a green tape method.

30. The method of claim 13, further comprising a final step of firing the bonding agent until the bonding agent has sintered thereby forming a bond between the terminal plate and the heating element.

31. The method of claim 30, wherein the final step takes place between 700°C and 900°C.

32. The method of claim 13, wherein the termination plate is curved to match the curvature of a substrate of the heater.

- 33. The method of claim 15 further comprising a final step of shielding the termination plate and a portion of the power conductor with a protective layer.
- 34. The method of claim 33, wherein the protective layer comprises glass insulation.
- 35. The method of claim 33, wherein the protective layer comprises a polymer.
- 36. The method of claim 33, wherein the protective layer comprises a ceramic.
- 37. The method of claim 13, wherein at least one of the heating elements is adapted for use with 3-phase power, the heating element having three end portions, each adapted to contact a termination plate.
- 38. The method of claim 13, wherein the bonding agent is applied directly to the terminal plate.
- 39. The method of claim 13, wherein the bonding agent is applied directly to the end portion of the heating element.
- 40. The method of claim 15, wherein the power conductors are attached by brazing.
- 41. The method of claim 22, wherein the bonding agent consists of an ink comprised primarily of a silver alloy.
- 42. The method of claim 22, wherein the bonding agent further comprises a glass frit.